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ABSTRACT

This study examined the relationship between intelligence as defined by a verbal and nonverbal combined score, obtained on the Otis-Lennon School Ability Test and final grades received in the following six academic subjects: reading, math, spelling, science, English and social studies. The sample for this study consisted of 159 elementary students in grades 3-5. The elementary school from which the sample was taken is located in rural Ohio, and which educates approximately 400 students, predominately white and from varied economic backgrounds. Grades were drawn from students' files and converted to A=4, B=3, C=2, D=1. Student intelligence quotient, involving a verbal and non-verbal score, was derived from the Otis-Lennon Ability Test administered in the fall of the students' second grade year. The results suggested a positive correspondence of relationship between intelligence and its ability to predict academic achievement. A positive correlation was found between intelligence score and the subject of reading (.49), English (.50), social studies (.44), science (.51) and math (.47). A lesser correlation was found with spelling (.30). No significant differences were noted in correlations between intelligence of genders and any of the academic categories. Contains 14 references. (AA)

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Relationship of Intelligence Quotients to Academic Achievement in the Elementary Grades

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Abstract

This study examines the relationship between intelligence as defined by a verbal and nonverbal combined score, obtained on the Otis-Lennon School Ability Test and final grades received in six academic subjects by 159; third, fourth, and fifth grade students at an elementary school in rural Ohio during one school year. A positive correlation was observed in all six academic subjects: reading, math, spelling, science, English, and social studies.

Relationship of Intelligence Quotients to Academic Achievement in the Elementary Grades

With today's national efforts to upgrade academic standards, the pressure to assess student achievement, the public's desire to hold educators accountable and the perception that testing and evaluation contribute to instructional effectiveness, it is not surprising that we are witnessing a dramatic increase in the use of test scores in making important instructional decisions (Ornstein, 1993). In this study, the purpose was to determine whether or not there were significant correlations between elementary school academic achievement in reading, English, spelling, math, social studies, and science and intelligence obtained by intelligence testing.

The field of intelligence testing developed from the work of early experimental psychologists. A focus on higher mental processes enabled Binet and Simon to develop tests of intelligence. The scales were revised in 1916 by Terman who adopted Stern's mental quotient and added the concept of the intelligence quotient. The success of the Binet-Simon Scales and their derivatives launched the twentieth century testing movement in the United States and many other countries (Sattler, 1984).

Use of measurement of intellectual abilities for educational purposes has followed two lines of historical development: a) testing for selection and placement b) assessment of educational outcomes (Glaser & Silver, 1994). Traditional assessments were developed to confront the dilemma of educators in the early part of the twentieth century. Educators were faced with determining which students would be able to profit best from uniform instruction (Nichols, 1994). The first foothold gained by mental testing in education may be seen, therefore, to have been concerned with the diagnosis of and provision for subnormality (Thomson & Sharp, 1988).

An intelligence test provides a general measure. Intelligence tests were once thought to measure innate abilities that were not subject to change. This assumption is invalid. To avoid implications of innateness many test makers today prefer to use the term aptitude or ability (Ornstein, 1993).

It has long been believed that before an intelligence test could be developed that intelligence must be defined. Intelligence has been defined as a measure of innate ability, observed behavior, and performance on specific tasks of cognitive ability. Innate ability, however, cannot be measured directly (Love, 1990). By 1905, Binet had spent 15 years accumulating data on individual differences. His writings indicate that he had not been able to approximate a satisfactory definition of the nature of intelligence (Glaser & Silver, 1994). The definition of intelligence continues to be a problem. Some theorists proposed a general theory of intelligence, where others viewed intelligence as being composed of many independent faculties. Many accept the theory that general intelligence coexists with separate independent abilities. Popular definitions of intelligence refer to the capacity of an individual and carry the meaning that intelligence is an inherited, unchangeable characteristic. These ideas of intelligence lead to the expectation that a test of "real intelligence" should measure this unalterable capacity and to the rejection of all tests because none of them lives up to this expectation (Sternberg, 1989).

Some critics of IQ tests have argued that IQ tests measure just about everything except intelligence: personality traits, cultural background, opportunity, quality of schooling, values, interests, attentiveness, distractibility, and so on (Jensen, 1980). Sattler felt that many critics fail to consider that tests have many valid uses. He also states that tests allow for accountability, for measurement of change, and for evaluation of program effectiveness (Sattler, 1984). Although none of us like having

our shortcomings pointed out, we must listen to our critics and make sure that we are following the best scientific and clinical practices (Sattler, 1984).

The controversy over the changeability of human intellectual development continues. A difficulty with research in intelligence has been a lack of agreement on what is being assessed and how accurately assessed the education population has been. This study investigates the question, how well does intelligence predict academic achievement. Academic achievement is defined as the academic grades (A, B, C, & D) received in the subjects of reading, math, social studies, science, English, and spelling. Intelligence is defined by the quotient obtained on the Otis-Lennon School Ability Test.

Method

Sample

The sample for this study consisted of 159 elementary students in grades 3-5. The elementary from which the sample was taken is located in rural Ohio. It is one of four elementaries in the school district and educates approximately 400 students, predominately, white from varied economic backgrounds.

Measures

The study compared the students' academic achievement in reading, English, spelling, science, social studies and math, which was measured by final grades obtained for one school year to their intelligence quotient. Grades were drawn from students' files and converted to A=4, B=3, C=2, D=l. Student intelligence quotient, involving a verbal and non-verbal score, was derived from the Otis-Lennon School Ability Test administered in the fall of the students' second grade year. The Otis-Lennon School Ability Test is a paper and pencil multiple choice test designed to measure abstract thinking and reasoning ability. It is a group-administered, objectively

scored, multi-level battery (Williams, 1984). Kuder-Richardson formula 20 estimates of reliability of the Otis-Lennon School Ability Test scores range from .91 to .95 (Dyer, 1985). Test-retest reliability coefficients based on a sample of students from four school systems range from .84 to .92. Published evidence for the validity of the test is meager. Validity estimates generally are high (Dyer, 1985).

Results

The results of the analyses concerning the relationship between intelligence and academic achievement are presented in Table I. A positive correlation was found between intelligence scores, obtained on the Otis-Lennon School Ability Test, and the subject areas of reading (.49), English (.50), social studies (.44), science (.51), and math (.47). A lesser correlation was found with spelling (.30). No significant differences were noted in correlations between intelligence of genders and any of the academic categories.

Place Table 1 about here

Discussion

A positive correspondence was established in this study of relationship between intelligence and its ability to predict academic achievement. With this information, we return to the testing movement of today. Educators are faced with the dilemma of how best to implement this piece of information and which students would be able to profit best (Nichols, 1994).

The cognitive abilities that one acquires will depend on the particular environmental challenges and opportunities that one deals with as well as underlying mental capacity for such acquisition (Ceci & Liker, 1986). It is clearly established that heredity exerts a significant impact on intelligence (e.g., Scarr & Weinberg, 1983; Ramey, 1992). The debate over the contributions of heredity and environment to

intelligence still rages (Gardner & Clark, 1992). Heredity, environment, and their interaction all play some role in mental development (Sternberg & Powell, 1983; Gardner & Clark, 1992). This could and does impact the results of this study.

In researching intelligence, the definitions remain unclear as to exactly how much of the intellectual potential is obtained through intelligence tests. If there was no correspondence in this study, we would assume that we, because of our impression/ judgment of what intelligence is, would doubt that this test measured intelligence. The IQ score has come to represent a person's intelligence. Many researchers are careful to separate test performance from the concept of intelligence. One of the most striking and most firmly established phenomena in all of psychology is the fact of positive correlations among virtually all tests of mental abilities (Jensen, 1980). It turns out that IQ scores are also very substantially correlated with parents', teachers', and peers' judgments of intelligence. The correlations between the teachers' ranking of pupils for "brightness" and their tested IQs are typically .60 and.80 (Jensen, 1980).

The goal of a logical explanation about a person and their performance in an academic setting needs to be supported by data and an IQ provides that.

> We feel beleaguered as educators by the constant attention to an apparent slippage in the achievement test scores. Thus we find ourselves saddled with an ever increasing array of tests and measures with which we are expected to demonstrate the knowledge and progress of our students. We identify increasing numbers of students in need of special education. At the same time, national attention focuses ever more closely on the establishment of national testing standards to identify those students who fail to meet nationwide criteria across content areas (Miller, 1993).

The results of the testing and study are obtained, but what of the individual academic potential has been, truly, found and how do educators best implement this information in education. Further research in this area is, obviously, needed.

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Table 1

Correlations Between School Grades and Academic Aptitude of 3rd, 4th, and 5th Grades

	Scores/Grades	Mean	Standard Deviation	No. of People	Correlation Coefficient
1	V+ NV Aptitude	212	28	159	---
2	Reading Grade	3.2	0.8	159	0.49
3	English Grade	3.1	0.8	159	0.5
4	Spelling Grade	3.5	0.7	159	0.3
5	Social Studies Grade	3.4	0.8	111	0.44
6	Science Grade	3.3	0.8	111	0.51
7	Math Grade	3.2	0.8	159	0.47

Note.

1. V+NV Aptitude was the combined verbal and nonverbal NCE score on the Otis-Lennon School Ability Test.

2. Grades were course grades with A=4; B=3; C=2; and D=1.

3. All coefficients were significant at the .01 level.